

## The Mathematics Assessment

The NAEP mathematics assessment measures students' ability to solve problems in five mathematics content strands: Number Properties and Operations; Measurement; Geometry; Data Analysis and Probability; and Algebra. Within each of these five content strands, students are asked questions that involve low, moderate, and high mathematical complexity.

The NAEP mathematics assessment includes multiple-choice questions, short-answer constructed-response questions, and extended constructed-response questions. The extended exercises allow students to communicate their ideas and demonstrate the reasoning they used to solve problems. The short-answer and extended-response questions make up approximately 50 percent of student assessment time. The assessment also incorporates the use of calculators, rulers, protractors, and ancillary materials such as spinners and geometric shapes in some parts of the assessment, but not all.

Scientific calculator use is permitted on approximately one-third of the test questions. At grade 12, students may use their own scientific or graphing calculators. For more information regarding the mathematics assessment framework please visit <http://nagb.org>.

### ***NAEP Mathematics Framework Distribution of Questions Across Content Strands***

Number Properties and Operations	10%
Measurement	30%
Geometry	
Data Analysis and Probability	25%
Algebra	35%

## Mathematics Booklet Directions

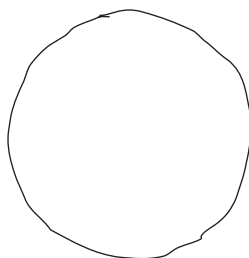
This assessment uses many different booklets. Each booklet has different questions. Do not worry if the person next to you is working on questions that do not look like those you are working on.

Read each question carefully and answer it as well as you can. Do not spend too much time on any one question.

For some of the questions you may need to write or draw the answer. You can see how this is done in the example below.

You may be given a calculator to use for at least one part of your booklet. If you are given a calculator, you will have to decide when to use it in each section where its use is permitted. For some questions using the calculator is helpful, but for other questions the

Draw a circle in the space below.



calculator may not be helpful. After each question you will be asked to indicate whether you used the calculator.

When you receive the calculator, make sure you know how to use it. There are instructions on the back cover of this booklet to help you. If the calculator does not work or if you do not know how to use it, raise your hand and ask for help.

### REMEMBER:

Read each question CAREFULLY.

Fill in only ONE OVAL for each question or write your answer in the space provided.

If you change your answer, ERASE your first answer COMPLETELY.

CHECK OVER your work if you finish a section early.

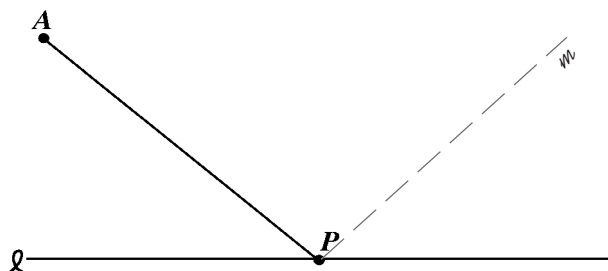
Do not go past the  sign at the end of each section until you are told to do so.



## Sample Mathematics Questions

### Grade 12

1. In the figure below, use the protractor to draw a line  $m$  through point  $P$  perpendicular to segment  $AP$ . In the answer space provided, give the measure of the smaller angle formed by lines  $\ell$  and  $m$ .



Answer: 50°

2. A certain machine produces 300 nails per minute. At this rate, how long will it take the machine to produce enough nails to fill 5 boxes of nails if each box will contain 250 nails?

- Ⓐ 4 min
- Ⓑ 4 min 6 sec
- 4 min 10 sec
- Ⓓ 4 min 50 sec
- Ⓔ 5 min

3. The table below shows the daily attendance at two movie theaters for 5 days and the mean (average) and the median attendance.

	<u>Theater A</u>	<u>Theater B</u>
Day 1	100	72
Day 2	87	97
Day 3	90	70
Day 4	10	71
Day 5	91	100
Mean (average)	75.6	82
Median	90	72

- (a) Which statistic, the mean or the median, would you use to describe the typical daily attendance for the 5 days at Theater A? Justify your answer.

I would use the median, since it successfully ignores the aberrance of day 4.

- (b) Which statistic, the mean or the median, would you use to describe the typical daily attendance for the 5 days at Theater B? Justify your answer.

I would use the mean, since the median gives an artificially low number – it does not reflect at all the two days of high attendance.



## Student Background Questionnaire

In this section, please tell us about yourself and your family. The section has 14 questions. Mark your answers in your booklet.

VB331330

VB331331

1. Are you Hispanic or Latino? Fill in one or more ovals.

- ☐ Ⓐ No, I am not Hispanic or Latino.
- ☐ Ⓑ Yes, I am Mexican, Mexican American, or Chicano.
- ☐ Ⓒ Yes, I am Puerto Rican or Puerto Rican American.
- ☐ Ⓓ Yes, I am Cuban or Cuban American.
- ☐ Ⓔ Yes, I am from some other Hispanic or Latino background.

2. Which of the following best describes you? Fill in **one or more ovals**.

- ☐ Ⓐ White
- ☐ Ⓑ Black or African American
- ☐ Ⓒ Asian
- ☐ Ⓓ American Indian or Alaska Native
- ☐ Ⓔ Native Hawaiian or other Pacific Islander

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GO ON TO THE NEXT PAGE

For the rest of the questions in this section, fill in only **one** oval for each question.

VB331333

3. Does your family get a newspaper at least four times a week?

☐ (A) Yes  
☐ (B) No  
☐ (C) don't know.

VB331337

7. Is there an encyclopedia in your home? It could be a set of books, or it could be on the computer.

☐ (A) Yes  
☐ (B) No  
☐ (D) don't know.

VB331334

4. Does your family get any magazines regularly?

☐ (A) Yes  
☐ (B) No  
☐ (C) I don't know.

TB001101

8. About how many pages a day do you have to read in school and for homework?

☐ (A) 5 or fewer  
☐ (B) 6–10  
☐ (C) 11–15  
☐ (D) 16–20  
☐ (E) More than 20

VB331335

5. About how many books are there in your home?

☐ (A) Few (0–10)  
☐ (B) Enough to fill one shelf (11–25)  
☐ (C) Enough to fill one bookcase (26–100)  
☐ (D) Enough to fill several bookcases (more than 100)

VB331339

9. How often do you talk about things you have studied in school with someone in your family?

☐ (A) Never or hardly ever  
☐ (B) Once every few weeks  
☐ (C) About once a week  
☐ (D) Two or three times a week  
☐ (E) Every day

VB331336

6. Is there a computer at home that you use?

☐ (A) Yes  
☐ (B) No

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VB331447

10. How many days were you absent from school in the last month?

- Ⓐ None
- Ⓐ 1 or 2 days
- Ⓑ 3 or 4 days
- Ⓒ 5 to 10 days
- Ⓓ More than 10 days

VB330870

11. How far in school did your mother go?

- Ⓐ She did not finish high school.
- Ⓑ She graduated from high school.
- Ⓒ She had some education after high school.
- Ⓓ She graduated from college.
- Ⓔ I don't know.

VB330871

12. How far in school did your father go?

- Ⓐ He did not finish high school.
- Ⓑ He graduated from high school.
- Ⓒ He had some education after high school.
- Ⓓ He graduated from college.
- Ⓔ I don't know.

VB331451

13. How often do people in your home talk to each other in a language other than English?

- Ⓐ Never
- Ⓑ Once in a while
- Ⓒ About half of the time
- Ⓓ All or most of the time

HE002549

14. Which of the following best describes your high school program?

- Ⓐ General
- Ⓑ Academic or college preparatory
- Ⓒ Vocational or technical



## Student Background Questionnaire

### Mathematics—Grade 12

This section has 16 questions. Mark your answer in your booklet. Unless directed otherwise, fill in only **one** oval for each question.

VB543279

1. Which courses have you taken from eighth grade to the present? **Fill in one or more ovals on each line.** INCLUDE courses taken in summer school, but DO NOT INCLUDE topics that were only taught as part of a longer course (such as trigonometry taught in drafting class or computer programming taught in Algebra II).

	I have never taken this course	I took this course in or before Grade 8	I took this course in Grade 9	I took this course in Grade 10	I took this course in Grade 11	I took this course in Grade 12
a. <b>Basic or general</b> mathematics course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
b. <b>Tech-prep</b> mathematics, <b>business</b> mathematics, <b>consumer</b> mathematics, or other <b>applied mathematics</b> course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
c. <b>Introduction to algebra</b> or <b>pre-algebra</b> course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
d. <b>Algebra I</b> course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
e. <b>Geometry</b> course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
f. <b>Algebra II</b> course, <b>with</b> or <b>without trigonometry</b>	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
g. <b>Trigonometry</b> (as a separate course)	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
h. <b>Pre-calculus</b> course, (also called third-year algebra or elementary functions and analysis)	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
i. <b>Unified, integrated, or sequential</b> mathematics course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
j. <b>Probability or statistics</b> course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
k. <b>Calculus</b> course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
l. <b>Discrete or finite</b> mathematics course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
m. <b>Other</b> mathematics course	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)
n. <b>Computer programming</b> course (such as C++, Pascal, Visual Basic, etc.)	<input type="radio"/> (A)	<input type="radio"/> (B)	<input type="radio"/> (C)	<input type="radio"/> (D)	<input type="radio"/> (E)	<input type="radio"/> (F)

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VB543295

2. Are you currently enrolled in or have you taken an Advanced Placement (AP) course in mathematics? Fill in **one or more** ovals.

- ☐ Ⓐ Yes, I am enrolled in or have taken Advanced Placement (AP) Calculus AB
- ☐ Ⓑ Yes, I am enrolled in or have taken Advanced Placement (AP) Calculus BC
- ☐ Ⓒ Yes, I am enrolled in or have taken Advanced Placement (AP) Statistics
- ☐ Ⓓ No, I have never taken an Advanced Placement (AP) mathematics course

VB543297

3. Are you currently enrolled in or have you taken any **online** mathematics courses for **high school or college credit**?

- ☐ Ⓐ Yes
- ☐ Ⓑ No

VB543264

4. How often do you use a computer to play mathematics games that are **not for a mathematics class**?

- ☐ Ⓐ Never or hardly ever
- ☐ Ⓑ Once every few weeks
- ☐ Ⓒ About once a week
- ☐ Ⓓ Two or three times a week
- ☐ Ⓔ Every day or almost every day

VB543267

5. What kind of calculator do you usually use when you are **not in mathematics class**?

- ☐ Ⓐ None
- ☐ Ⓑ Basic four-function (addition, subtraction, multiplication, division)
- ☐ Ⓒ Scientific (not graphing)
- ☐ Ⓓ Graphing

VB517284

6. Are you currently taking a mathematics course?

- ☐ Ⓐ Yes → **Go to Question 7**
- ☐ Ⓑ No → **Skip to Question 14.**

VB525162

VB543148

7. How often do you use a computer for mathematics at school?

- ☐ Ⓐ Never or hardly ever
- ☐ Ⓑ Once every few weeks
- ☐ Ⓒ About once a week
- ☐ Ⓓ Two or three times a week
- ☐ Ⓔ Every day or almost every day

8. On a typical day, how much time do you spend doing work for mathematics class on a computer? Include work you do in class and for homework.

- ☐ Ⓐ None
- ☐ Ⓑ Half an hour or less
- ☐ Ⓒ About 1 hour
- ☐ Ⓓ About 2 hours
- ☐ Ⓔ More than 2 hours

VB543155

9. When you are doing mathematics for school or homework, how often do you use these **different types of computer programs**? Fill in **one** oval on each line.

	Never or hardly ever	Once every few weeks	About once a week	Two or three times a week	Every day or almost every day
a. A spreadsheet program for mathematics class assignments	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
b. A program to practice or drill on math facts (addition, subtraction, multiplication, division)	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
c. A program that presents new mathematics lessons with problems to solve	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
d. The Internet to learn things for mathematics class	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
e. A calculator program on the computer to solve or check problems for mathematics class	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
f. A graphing program on the computer to make charts or graphs for mathematics class	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
g. A statistical program to calculate patterns such as correlations or cross-tabulations	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ

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VB543149

10. When you are **doing mathematics for school or homework**, how often do you **use a computer** for the following? Fill in **one** oval on each line.

	Never or hardly ever	Once every few weeks	About once a week	Two or three times a week	Every day or almost every day
a. Chat online with friends about mathematics class work or homework (for example, e-mail, chat rooms, or instant messaging)	(A)	(B)	(C)	(D)	(E)
b. Find out about mathematics class work or homework from your teacher using e-mail, instant messaging, web, etc.	(A)	(B)	(C)	(D)	(E)
c. Use a computer to get help with mathematics from an outside source (for example, online tutoring)	(A)	(B)	(C)	(D)	(E)

VB517159

11. How often do you use these different types of calculators in your mathematics class?

	Never use	Sometimes but not often	Usually use
a. Basic four-function (addition, subtraction, multiplication, division)	(A)	(B)	(C)
b. Scientific (not graphing)	(A)	(B)	(C)
c. Graphing	(A)	(B)	(C)

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VB543269

12. For each of the following activities, how often do you use a **calculator**? Fill in **one** oval on each line.

	Never or hardly ever	Once every few weeks	About once a week	Two or three times a week	Every day or almost every day
a. To check your work on mathematics homework assignments	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
b. To calculate the answers to mathematics homework problems	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ
c. To work in class on mathematics lessons led by your teacher	<input type="radio"/> Ⓐ	<input type="radio"/> Ⓑ	<input type="radio"/> Ⓒ	<input type="radio"/> Ⓓ	<input type="radio"/> Ⓔ

VB517158

13. When you take a mathematics test or quiz, how often do you use a calculator?

- ☐ Ⓐ Never
- ☐ Ⓑ Sometimes
- ☐ Ⓒ Always

VC034595

15. How hard did you try on this test, compared to how hard you tried on most other tests you have taken this year in school?

- ☐ Ⓐ Not as hard as on other tests
- ☐ Ⓑ About as hard as on other tests
- ☐ Ⓒ Harder than on other tests
- ☐ Ⓓ Much harder than on other tests

VB595182

14. How hard was this test compared to most other tests you have taken this year in school?

- ☐ Ⓐ Easier than other tests
- ☐ Ⓑ About as hard as other tests
- ☐ Ⓒ Harder than other tests
- ☐ Ⓓ Much harder than other tests

VB595184

16. How important was it to you to do well on this test?

- ☐ Ⓐ Not very important
- ☐ Ⓑ Somewhat important
- ☐ Ⓒ Important
- ☐ Ⓓ Very important

